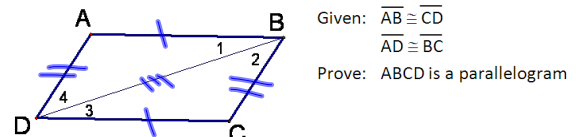
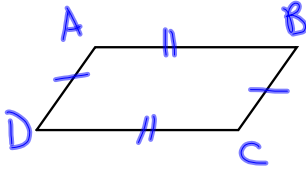


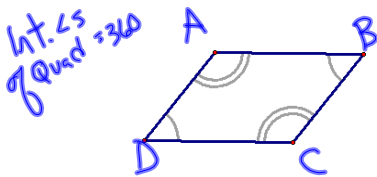
### 8.3 Show that a Quadrilateral is a Parallelogram

Theorem 8.7 If both pairs of opposite sides are congruent, then the quadrilateral is a parallelogram.



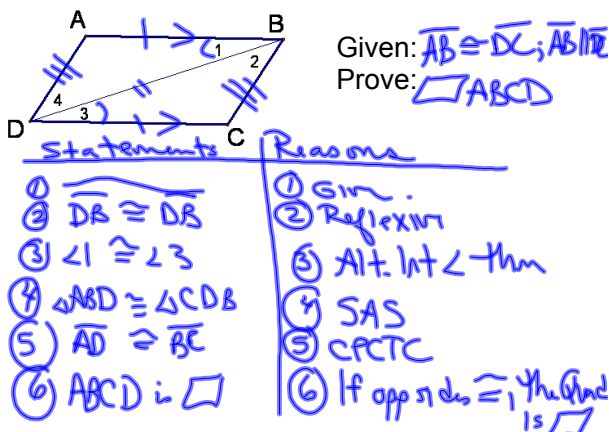
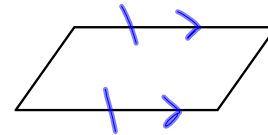
Statements	Reasons
① $\overline{DB} \cong \overline{DB}$	① Given
② $\triangle ABD \cong \triangle CDB$	② Reflexive
③ $\angle 1 \cong \angle 3$ $\angle 2 \cong \angle 4$	③ SSS
④ $\overline{AB} \parallel \overline{CD}$ $\overline{AD} \parallel \overline{BC}$	④ CPCTC
⑤ ABCD is a parallelogram	⑤ Alt. Int. $\angle$ s Conv.
	⑥ def of $\square$

Theorem 8.8 If both pairs of opposite angles are congruent, then the quadrilateral is a parallelogram.

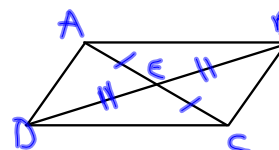


Proof plan?

Theorem 8.9 If one pair of opposite sides is both congruent and parallel, then the quadrilateral is a parallelogram.

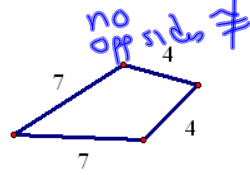
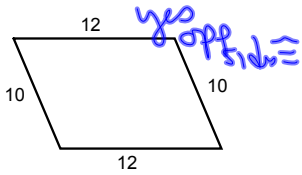
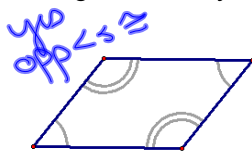
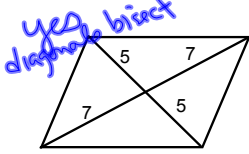


Theorem 8.10 If the diagonals bisect each other, then the quadrilateral is a parallelogram.

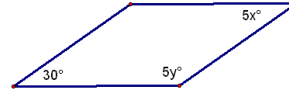


Proof plan?

Are the following parallelograms? Why?



Find  $x$  and  $y$  so that the quad. is a parallelogram.



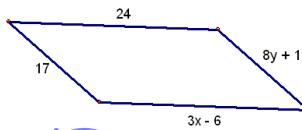
$$5y + 30 = 180$$

$$y = 30$$

$$5x = 30$$

$$x = 6$$

Find  $x$  and  $y$  so that the quad. is a parallelogram.



$$8y + 1 = 17$$

$$y = 2$$

$$3x - 6 = 24$$

$$x = 10$$

Parallelograms on the coordinate plane.

- distance, midpoint, and slope can be used to determine if a quadrilateral is a parallelogram

→ opp sides  $\cong$

Midpoint → diagonals bisect each other

Slope - opp sides  $\parallel$

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(0, 0) B(1, 3) C(5, 3) D(4, 0)

Slope formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\overline{AB} \quad m = \frac{3-0}{1-0} = 3 \quad \checkmark$$

$$\overline{DC} \quad m = \frac{3-0}{5-4} = 3 \quad \checkmark$$

$$\overline{AD} \quad m = 0 \quad \checkmark$$

$$\overline{BC} \quad m = 0 \quad \checkmark$$

ABCD is  $\square$   
b/c opp sides are  $\parallel$

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

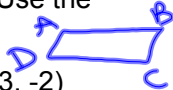
T(0, 0) R(1, 3) A(5, 3) E(4, 0)

Slope formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-1, 0) B(3, 0) C(2, -3) D(-3, -2)



Distance formula

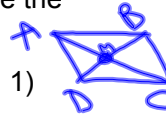
$$AB = \sqrt{(3 - (-1))^2 + (0 - 0)^2} = 4 \quad \text{Not a } \square$$

$$CD = \sqrt{(2 - (-3))^2 + (-3 - (-2))^2} = \sqrt{26}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-2, 4) B(-1, -1) C(3, -4) D(2, 1)



Midpoint formula

$$\overline{AC} \quad M(.5, 0)$$

$$\overline{BD} \quad M(.5, 0)$$

yes  
b/c  
diagonals  
bisect each  
other

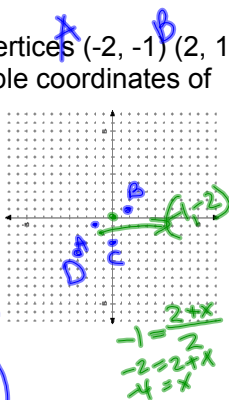
A parallelogram has the vertices  $(-2, -1)$ ,  $(2, 1)$  and  $(0, -3)$ . Find all possible coordinates of the 4th vertex.

$(0, 3)$  or C

midpt  $\overline{AB}$   $(0, 0)$

midpt  $\overline{AC}$  opp B  $(-4, -5)$

midpt  $\overline{BC}$  opp A  $(4, -1)$



HW

p526-529

4-6, 11-14, 19-21, 25, 26, 38, 39